
NASA-05311 (June 2004)
NATIONAL AERONAUTICS NASA
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SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05311

STEEL FLOOR DECK

06/04

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
 - 1.2.1 Performance Requirements
 - 1.2.2 Underwriters Laboratories Inc. Listing and Label
- 1.3 SUBMITTALS
- 1.4 QUALIFICATIONS FOR WELDING WORK
- 1.5 DELIVERY, STORAGE, AND HANDLING
- 1.6 INSTALLATION INFORMATION

PART 2 PRODUCTS

- 2.1 MATERIALS
 - 2.1.1 Structural-Quality Steel Sheets
 - 2.1.2 Commercial-Quality Steel Sheets
 - 2.1.3 Electrodes for Manual Shielded Metal Arc Welding
- 2.2 MIXES
 - 2.2.1 Galvanizing Repair Paint
 - 2.2.2 Repair Paint of Painted Surfaces
- 2.3 FABRICATION
 - 2.3.1 Cellular Metal Floor Deck Units
 - 2.3.2 Open Beam, Metal Floor Deck Units
 - 2.3.3 Length of Floor Deck Units
 - 2.3.4 Metal Cover Plates
 - 2.3.5 Metal Closures

PART 3 EXECUTION

- 3.1 PREPARATION
 - 3.1.1 Welding
- 3.2 INSTALLATION
 - 3.2.1 Placing Floor Deck Units
 - 3.2.2 Fastening Floor Deck Units
 - 3.2.3 Joint Covers
 - 3.2.4 Hanger Slots
 - 3.2.5 Cutting and Fitting
 - 3.2.6 Reinforcement at Openings
 - 3.2.7 Metal Closures
 - 3.2.8 Touchup Painting

-- End of Section Table of Contents --

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SECTION 05311

STEEL FLOOR DECK
06/04

NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers cellular steel floor decking, or a combination of cellular and open-beam steel floor decking for floor and roof construction, including long-span metal floor decking to receive normal weight concrete fill and cellular steel floor decking with cells suitable for use as air ducts or electrical raceways, if required.

Drawings must include the following:

A complete design indicating the character of the work to be performed and giving the structural framing, metal floor deck section properties, details of accessories, details of openings, and sufficient dimensions to convey adequately the quantity and nature of the required metal floor decking

Assumed loads and other design data as may be required for the proper preparation of shop drawings

Metal floor deck cells that will be used for air ducts

Metal floor deck cells that will be used for electrical raceways

When both fire-resistance-rated construction and non-rated construction is required, the location of fire-resistance-rated construction must be indicated

Metal decking for roof construction, consisting of insulation board and builtup roofing placed over short-span, narrow-rib-type steel roof decking, is specified in Section 05310, "Metal Roof Deck."

Metal decking for floor and roof construction consisting of concrete fill placed over shortspan, corrugated type, metal form decking, is specified in Section 03131, "Permanent Steel Forms."

Fire-resistance-rated floor or roof and ceiling constructions using metal floor decking are described in Underwriters Laboratories Inc., (BXUV) "Fire Resistance Ratings" (included in UL Fire Resistance Directory) and the "Fire Resistance Ratings" contained in the National Building Code recommended by the American Insurance Association AIA CO-1.

PART 1 GENERAL

1.1 REFERENCES

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

The publications listed below form a part of this section to the extent referenced:

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-671	(1989) Specification & Commentary for the Design of Cold-Formed Steel Structural Members
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AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A5.1	(2003) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2004) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 525	(1993) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 525M	(1991; Rev A) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process (Metric)
ASTM A 526/A 526M	(1990) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A 780	(2001) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip

Galvanized Coatings

U.S. DEPARTMENT OF DEFENSE (DOD)

MS MIL-P-23377 (1989f) Primer Coatings: Epoxy, Chemical
and Solvent Resistant

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (2003) Building Materials Directory

UL Elec Const Dir (2003) Electrical Construction Equipment
Directory

1.2 SYSTEM DESCRIPTION

1.2.1 Performance Requirements

Properties of metal floor deck sections shall be computed on the basis of the effective design width, as limited by the provisions of AISI SG-671.

Floor deck section properties, including section modulus and moment of inertia per foot 310 millimeter of width, shall equal or exceed the required values of section properties.

1.2.2 Underwriters Laboratories Inc. Listing and Label

NOTE: Delete paragraph heading and following paragraphs when UL-listed floor deck units or electrical raceway floor deck units, or both, are not required. Delete the second of the following paragraphs when floor deck unit cells will not be used for electrical raceways either under this contract or in the future.

Metal floor deck units shall be listed in UL Bld Mat Dir "Building Material Directory," "Steel Form and Floor Units," (CHWX), and each floor deck unit shall bear UL label and marking.

Cellular floor deck units shall be listed in both the UL Bld Mat Dir "Building Material Directory" and UL Elec Const Dir "Electrical Construction Materials Directory," "Raceways - Cellular Metal Floor," (RHZX) and each cellular metal floor deck unit shall bear both UL labels and markings.

1.3 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Fabrication drawings for the following items shall be in accordance with the paragraph entitled, "Fabrication," of this section.

Metal Floor Deck Units
Metal Cover Plates
Metal Closures

Installation Drawings for metal deck units shall be in accordance with paragraph entitled, "Installation Information," of this section.

SD-03 Product Data

Manufacturer's catalog data shall be submitted in accordance with paragraph entitled, "Qualifications for Welding Work," of this section.

Welder Qualifications
Welding Equipment
Welding Rods and Accessories

SD-04 Samples

Samples of the following shall be submitted in accordance with paragraph entitled, "Fabrication," of this section.

Metal Floor Deck Units

SD-07 Certificates

Welding Procedures shall be in accordance with AWS D1.1/D1.1M.

Certificates for Welder Qualifications shall be in accordance with the paragraph entitled, "Qualifications for Welding Work," of this section.

Certificates shall be provided for the following items showing conformance to the referenced standards contained in this section.

Galvanizing Repair Paint
Repair Paint
Metal Floor Deck Units

SD-08 Manufacturer's Instructions

Installation Instructions for metal floor deck units shall be submitted in accordance with paragraph entitled, "Installation Information," of this section.

1.4 QUALIFICATIONS FOR WELDING WORK

NOTE: If Section 05095, "Welding Steel Construction," is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.

[Section 05095, "Welding Steel Construction," applies to work specified in this section.]

[Welding Procedures shall be in accordance with AWS D1.1/D1.1M. Test specimens shall be made in the presence of Contracting Officer and shall be tested by an approved testing laboratory at the Contractor's expense.]

Welder Qualifications shall be submitted and they shall have been qualified by test in accordance with AWS D1.1/D1.1M, or under an equivalent approved qualification test. Tests shall be performed on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, an immediate retest of two test welds shall be made, and each test weld shall pass. Failure in the immediate retest will require that the welder be retested after further practice or training, and a complete set of test welds shall be made.]

Manufacturer's catalog data shall be submitted for Welding Equipment and Welding Rods and Accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

Decking stored at the site before erection shall be stacked on platforms or pallets and covered to provide a weathertight enclosure, and protection against the weather.

Packaged materials shall be stored in their original, unbroken package in a dry area until needed for installation.

Floor decking shall not be used for storage or as a working platform until the floor deck units have been permanently fastened in position. Floor decking shall not be damaged or overloaded during construction.

1.6 INSTALLATION INFORMATION

Installation Drawings for metal deck units shall be submitted by the Contractor prior to construction. Drawings shall detail the following:

Field measurements shall be taken prior to preparation of drawings and fabrication.

Details and layouts indicating the structural framing, location, length and markings of the metal deck units, corresponding with the sequence and procedure to be followed in placing and fastening the deck units; and location, type, and sequence of welded connection; welds shall be indicated in accordance with AWS A2.4.

Deck unit cross section, with dimensions, and complete computations of unit section properties.

Accessories and methods of installation, including reinforcement at openings.

Size and number of openings to be cut in the metal decking.

Location of metal deck cells to be used for air ducts.

Location of metal deck cells to be used for electrical raceways.

When both fire-resistance-rated and non-rated construction are required, the location of fire-resistance-rated construction shall be shown.

Installation Instructions shall indicate the metal deck unit manufacturer's recommended method and sequence of installation.

PART 2 PRODUCTS

**NOTE: Interior floor deck sheets do not normally
require galvanizing unless exposed to humid or
corrosive conditions.**

2.1 MATERIALS

2.1.1 Structural-Quality Steel Sheets

Steel sheets shall be hot-dip galvanized, carbon steel sheets having minimum yield point of 33,000 pounds per square inch (psi) 227527 kilopascal conforming to ASTM A 525, G90 ASTM A 525M, Z275.

2.1.2 Commercial-Quality Steel Sheets

Steel sheets shall be hot-dip galvanized carbon steel sheets conforming to ASTM A 526/A 526M, with zinc coating conforming to ASTM A 525 ASTM A 525M, G90.

2.1.3 Electrodes for Manual Shielded Metal Arc Welding

Electrodes shall meet the requirements of AWS D1.1/D1.1M, and shall be covered mild steel electrodes conforming to AWS A5.1, E60 series.

2.2 MIXES

2.2.1 Galvanizing Repair Paint

Paint shall be a high-zinc-dust content paint for regalvanizing welds in galvanized steel and shall conform to ASTM A 780.

2.2.2 Repair Paint of Painted Surfaces

Paint shall be an inhibitive polyamide epoxy conforming to MS MIL-P-23377.

2.3 FABRICATION

One sample of each type of Metal Floor Deck Units used shall be furnished to illustrate the actual cross section dimensions and configuration.

2.3.1 Cellular Metal Floor Deck Units

Units shall be fabricated from the specified structural-quality steel sheets. Nominal thickness of the steel sheets, before galvanizing, shall be not less than 18-gage 1.3 millimeter for the upper element of the floor deck unit, and not less than 16-gage 1.6 millimeter for the lower element of the floor deck unit.

Welds, forming the steel sheets into the cellular floor deck unit, shall be sufficient to develop the full horizontal shear at the plane where the steel sheets are joined.

NOTE: Delete inapplicable paragraphs. When fire-resistance-rated construction is required, the fire rating agency's specifications for the applicable floor or roof and ceiling construction must be consulted.

Cellular metal floor deck units shall be fluted section cells combined on a flat plate having interlocking type sidelaps. Depth, width of unit, number of cells per unit, and width of cells shall be as follows:

NOTE: Delete the following cellular floor deck units that are not required.

DEPTH MINIMUM (inches)	WIDTH OF UNIT NOMINAL (inches)	NUMBER OF CELLS PER UNIT	WIDTH OF CELLS NOMINAL (inches)
1-1/2	24	4	3-5/8
1-1/2	24	2	9-5/8
1-1/2	12	1	9-5/8
3	24	3	5-5/8
3	24	2	9-5/8
3	12	1	9-5/8
4-1/2	24	4	2-5/8
4-1/2	24	2	9-5/8
4-1/2	12	1	9-5/8
6	24	2	9-5/8
6	12	1	9-5/8
7-1/2	24	2	9-5/8
7-1/2	12	1	9-5/8

<u>DEPTH MINIMUM (millimeter)</u>	<u>WIDTH OF UNIT NOMINAL (millimeter)</u>	<u>NUMBER OF CELLS PER UNIT</u>	<u>WIDTH OF CELLS NOMINAL (millimeter)</u>
38	600	4	92
38	600	2	245
38	300	1	245
75	600	3	143
75	600	2	245
75	300	1	245
115	600	4	67
115	600	2	245
115	300	1	245
150	600	2	245
150	300	1	245
190	600	2	245
190	300	1	245

Cellular metal floor deck units shall be fluted section cells combined with a matching fluted bottom section having interlocking type sidelaps. Depth, width of unit, number of cells per unit, and width of cells shall be as follows:

**NOTE: Delete the following floor deck units that
are not required.**

<u>DEPTH MINIMUM (inches)</u>	<u>WIDTH OF UNIT NOMINAL (inches)</u>	<u>NUMBER OF CELLS PER UNIT</u>	<u>WIDTH OF CELLS NOMINAL (inches)</u>
3	24	4	3-5/8
3	12	1	9-5/8
6	24	3	5-5/8

<u>DEPTH MINIMUM (millimeter)</u>	<u>WIDTH OF UNIT NOMINAL (millimeter)</u>	<u>NUMBER OF CELLS PER UNIT</u>	<u>WIDTH OF CELLS NOMINAL (millimeter)</u>
75	600	4	92
75	300	1	245

DEPTH MINIMUM (millimeter)	WIDTH OF UNIT NOMINAL (millimeter)	NUMBER OF CELLS PER UNIT	WIDTH OF CELLS NOMINAL (millimeter)
150	600	3	143

2.3.2 Open Beam, Metal Floor Deck Units

NOTE: Delete paragraph heading and following paragraphs when a combination of cellular and open beam metal floor deck units are not required.

Open beam metal floor deck units shall be fabricated of the specified structural-quality steel sheets. Nominal thickness of the steel sheets before galvanizing shall be not less than 18-gage 1.3 millimeter.

Open beam metal floor deck units shall be fluted section having interlocking type sidelaps. Depth, width of unit, number of flutes per unit, and width of flutes shall be as follows:

NOTE: Delete the following open beam floor deck units that are not required. Open beam floor deck units must match the depth and fluted section of the adjacent cellular floor deck units as specified.

DEPTH MINIMUM (inches)	WIDTH OF UNIT NOMINAL (inches)	NUMBER OF CELLS PER UNIT	WIDTH OF CELLS NOMINAL (inches)
1-1/2	24	4	3-5/8
1-1/2	24	2	9-5/8
1-1/2	12	1	9-5/8
3	24	3	5-5/8
3	24	2	9-5/8
3	12	1	9-5/8
4-1/2	24	2	9-5/8
4-1/2	12	2	2-5/8
4-1/2	12	1	9-5/8
6	24	2	9-5/8
6	12	1	9-5/8
7-1/2	24	2	9-5/8
7-1/2	12	1	9-5/8

<u>DEPTH MINIMUM (millimeter)</u>	<u>WIDTH OF UNIT NOMINAL (millimeter)</u>	<u>NUMBER OF CELLS PER UNIT</u>	<u>WIDTH OF CELLS NOMINAL (millimeter)</u>
38	600	4	92
38	600	2	245
38	300	1	245
75	600	3	143
75	600	2	245
75	300	1	245
115	600	4	67
115	600	2	245
115	300	1	245
150	600	2	245
150	300	1	245
190	600	2	245
190	300	1	245

2.3.3 Length of Floor Deck Units

Floor deck units shall be of sufficient length to span three or more spacings where possible.

2.3.4 Metal Cover Plates

Cover plates for abutting floor deck units shall be fabricated from the specified structural-quality steel sheets not less than nominal 18-gage 1.3 millimeter thick before galvanizing. Cover plates shall be approximately 6-inches 150 millimeter wide and formed to match the contour of the floor deck units.

2.3.5 Metal Closures

Closures for cell raceways shall be fabricated from the specified commercial-quality steel sheets not less than nominal 18-gage 1.3 millimeter thick before galvanizing.

Closures for openings between floor decking and other construction shall be fabricated from the specified structural-quality steel sheets not less than 18-gage 1.3 millimeter nominal thick before galvanizing.

Metal closures shall be of the configuration required to provide tight-fitting closures at open ends of cells or flutes and sides of the floor decking.

PART 3 EXECUTION

3.1 PREPARATION

Cellular metal floor deck units and accessories shall be installed in accordance with the approved shop drawings and descriptive data.

3.1.1 Welding

Welds shall conform to AISI SG-671, "Fusion-Welds."

Procedures for manual, shielded metal arc welding, the appearance and quality of welds made, and the methods used in correcting welding work shall conform to AWS D1.1/D1.1M, "Workmanship" and "Technique," except for such requirements that are clearly not applicable to light-gage steel construction. Use applicable Sections 15055, "Welding Mechanical" and 05095, "Welding Steel Construction."

3.2 INSTALLATION

3.2.1 Placing Floor Deck Units

Supporting members shall be completely in place before the placing of cellular metal floor deck units is started. Units shall be placed on the supporting steel framework and adjusted to final position with ends bearing on the supporting members and accurately aligned, end to end, before being permanently fastened. End bearings shall be not less than 3 inches. 76 millimeter. Floor deck units shall be placed in straight alignment for the entire length of run of cells and with close alignment between cells at ends of abutting floor deck units. Placing and aligning of the units shall be done to maintain the required number of units and to prevent stretching or contracting of the sidelap interlocks.

3.2.2 Fastening Floor Deck Units

NOTE: When fire-resistance-rated construction is required, the fire rating agency's specifications for the applicable floor or roof and ceiling construction must be consulted.

Floor deck units shall be fastened to the steel supporting members at ends and at all intermediate supports, both parallel and perpendicular to deck span, by welds. Spacing of welds shall not exceed 12 inches 300 millimeter on center, with a minimum of two welds per floor deck unit at each support.

Welds shall be 3/4-inch 20 millimeter minimum diameter fusion welds. Welding sequence and procedure shall be coordinated with the placing of the floor deck units. Blow holes shall be cause for rejection.

Sidelaps between adjacent floor deck units shall be locked together at intervals not exceeding 48 inches 1220 millimeter on center by welding or button punching for all spans.

[The interior of cells that will be used for electrical raceways shall be free of welds having sharp points or edges.]

3.2.3 Joint Covers

Metal cover plates shall be provided for abutting ends of the floor deck units and shall be installed as follows:

NOTE: Delete the first of the following three paragraphs when electrical raceways are required. Delete the second and third paragraphs when electrical raceways are not required.

[Metal cover plates shall be welded in place with weld spacing not exceeding 12 inches 300 millimeter on center.]

[Except where the cells in cellular floor deck units will be used for electrical raceways, metal cover plates shall be welded in place, with weld spacing not exceeding 12 inches 300 millimeter on center.]

Where the cells in cellular floor deck units will be used for electrical raceways, metal cover plates shall be temporarily placed under the work of this section.

NOTE: Delete the following paragraph when metal cover plates are required.

Pressure-sensitive tape shall be provided for abutting ends of the floor deck units.

3.2.4 Hanger Slots

Slots shall be punched between cells or flutes of the lower element of floor deck units to receive hangers for support of the ceiling construction, air ducts, diffusers, and lighting fixtures. Hanger clips designed to clip over the male sidelap joints of the floor deck units may be used instead of hanger slots. Hanger slots or hanger clips shall be located not more than 24 inches 600 millimeter on center in both directions, not more than 9 inches 230 millimeter from walls at ends, and not more than 12 inches 300 millimeter from walls at sides.

3.2.5 Cutting and Fitting

Cutting and fitting of floor deck units shall be performed as required for the passage of other work projecting through, or adjacent to, the floor decking.

Additional metal reinforcement and closure pieces shall be provided, as required for strength, continuity of the floor decking, or the support of other work.

3.2.6 Reinforcement at Openings

NOTE: Openings larger than 12 inches 300 millimeter in any dimension must be framed with steel supporting members and provided as a part of the structural framing system.

Floor decking around openings 6 to 12 inches 150 to 300 millimeter in size shall be reinforced by means of a flat, galvanized, structural-quality steel sheet placed over the opening on the top of the floor decking and fusion welded to the surface of the floor decking. Steel sheets shall be not less than nominal thickness of 18-gage 1.3 millimeter before galvanizing and at least 12-inches 300 millimeter wider and longer in size than the opening. Spacing of welds shall not exceed 12 inches 300 millimeter on center, with not less than one weld at each corner.

3.2.7 Metal Closures

Metal closures shall be provided for open ends of cell raceways at openings, columns, walls, and other building construction and to close openings between floor decking and other building construction. Metal closures shall be tack welded in position.

3.2.8 Touchup Painting

After floor decking installation, scarred areas on the top and bottom surfaces of the metal floor decking and on the surface of supporting steel members shall be wire-brushed, cleaned, and touchup painted. Scarred areas shall include welds, weld scars, bruises, and rust spots. Galvanized surfaces shall be touched up with galvanizing repair paint. Painted surfaces shall be touched up with paint for the repair of painted surfaces.

-- End of Section --